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**Fluorescence diffuse optical tomography with functional and anatomical a priori information: feasibility study.**

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**Public Summary:**

**Scientific Abstract:**

Fluorescence diffuse optical tomography (FT) is an emerging molecular imaging technique that can spatially resolve both fluorophore concentration and lifetime parameters. In this study, we investigate the performance of a frequency-domain FT system for small inclusions that are embedded in a heterogeneous background. The results demonstrate that functional and structural a priori information is crucial to be able to recover both parameters with high accuracy. The functional a priori information is defined by the absorption and scattering maps at both excitation and emission wavelengths. Similarly, the boundaries of the small inclusion and different regions in the background are utilized as the structural a priori information. Without a priori information, the fluorophore concentration of a 5 mm inclusion in a 40 mm medium is recovered with 50% error, while the lifetime cannot be recovered at all. On the other hand, when both functional and structural information are available, the true lifetime can be recovered and the fluorophore concentration can be estimated only with 5% error. This study shows that a hybrid system that can acquire diffuse optical absorption tomography (DOT), FT and anatomical images in the same setting is essential to be able to recover the fluorophore concentration and lifetime accurately in vivo.

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